Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

54 C

LIBRARY
RECEIVED
2 1933 ★
U. S. Department of Agriculture

CIRCULAR No. 302 SEPTEMBER 1933
UNITED STATES DEPARTMENT OF AGRICULTURE
WASHINGTON, D.C.

FIGHT GRASSHOPPERS BY PLOWING STUBBLE

By J. R. Parker, *senior entomologist, Division of Cereal and Forage Insects, Bureau of Entomology*

CONTENTS

	Page
Where grasshoppers lay their eggs	1
Migratory grasshopper the most abundant in 1933	2
How plowing destroys the grasshoppers	3
When and how to plow	3
"Stubbling-in" encourages grasshopper outbreaks	3
Cooperative measures most effective	4

Plowing stubble land during the fall or early spring is a simple but effective method of killing grasshoppers. If every acre of grain and flax stubble in grasshopper-infested areas could be plowed before next May, the cost of grasshopper control in 1934 would be reduced at least 50 percent. The migratory grasshopper (*Melanoplus mexicanus* Sauss.) (fig. 1), now present (late summer of 1933) in enormous numbers in several States and Canadian Provinces, selects standing grain or flax, or the fresh stubble of these crops, in preference to all other locations for egg laying. If the stubble is plowed before the eggs hatch, which normally occurs about May 15 in the Great Plains area, the eggs are buried so deeply that the young grasshoppers, upon hatching, are unable to reach the surface.

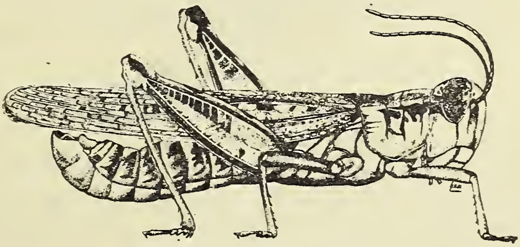

Figure 1.—The migratory grasshopper (*Melanoplus mexicanus* Sauss.).

WHERE GRASSHOPPERS LAY THEIR EGGS

Grasshoppers differ in their egg-laying habits. As stated above, the migratory grasshopper prefers to scatter its eggs throughout the field of growing grain or flax or in the fresh stubble of such crops. Late flax, barley, and oats, because they offer both green food and the desired soil condition, are particularly attractive. Fields in which crops are damaged by drought or grasshoppers early in the summer to such an extent that they are not harvested often become covered with Russian thistles and other weeds, which provide succulent food after native vegetation has become dry and unpalatable. Such fields are almost as attractive for egg laying as those in late

9619°—33

crops of small grains and flax. Because of unusual drought conditions there are now thousands of these fields in which great numbers of grasshopper eggs have been laid.

The differential grasshopper (*Melanoplus differentialis* Thos.) and the 2-striped grasshopper (*M. bivittatus* Say) (fig. 2), the two most destructive species in 1931 and 1932, instead of scattering their eggs throughout cultivated fields, concentrate them in great numbers on the land bordering the crops upon which they have been feeding. Sod land between the crop and the fence, or along highways and railroad rights-of-way, is a favorite egg-laying ground for these species, and tilled fields are selected for extensive egg laying only when they are very weedy or contain clumps of grass.

Because of their habits of concentrating their eggs outside tilled fields, the differential grasshopper and the two-striped grasshopper are easier to fight than the migratory grasshopper. Great numbers can often be destroyed by plowing a narrow strip of sod around the field after egg laying is over; and if poisoning is started as soon as crops are attacked, they can generally be saved by several applications of poisoned-bran mash scattered around the edges of the field.

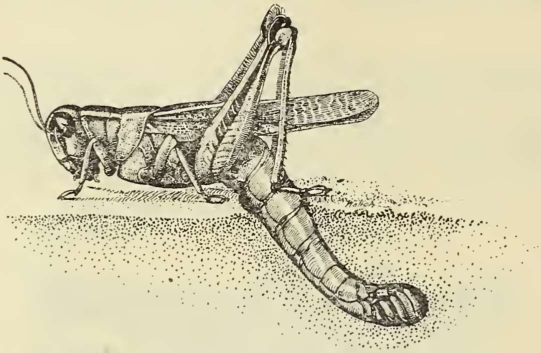

FIGURE 2.—The two-striped grasshopper (*Melanoplus bivittatus* Say) in the act of laying its eggs.

MIGRATORY GRASSHOPPER THE MOST ABUNDANT IN 1933

During 1931 and 1932 the migratory grasshopper was present in injurious numbers in only a few localities in North Dakota, South Dakota, Minnesota, and Montana. The differential grasshopper, the two-striped grasshopper, and the clear-winged or warrior grasshopper (*Camnula pellucida* Scudd.), which also lays its eggs in sod land, were responsible for at least 90 percent of the damage done during those years. The situation in 1933 is decidedly different. The migratory grasshopper hatched in great numbers in southern Manitoba, Saskatchewan, western North Dakota, and northeastern Montana, and in scattered localities in South Dakota. Conditions were extremely favorable for their survival. The species is migratory in habit, and extensive flights were observed throughout July and the first half of August. Recent surveys have shown that, as a result of these flights, it is now the dominant species throughout North Dakota, a large part of South Dakota, and across northern Montana to the Rocky Mountains.

The differential, two-striped, and clear-winged grasshoppers are still present in large numbers and, with the migratory grasshopper added to this list of destructive species, the grasshopper outlook for 1934 is extremely serious.

HOW PLOWING DESTROYS THE GRASSHOPPERS

The migratory grasshopper normally lays its eggs in tilled fields regardless of whether these are clean or filled with weeds and grass. The differential and two-striped grasshoppers lay their eggs in such fields only when they are weedy and grassy, and this year, because of early drought, thousands of fields are now in this condition. This means that all stubble land in grasshopper areas is very likely to contain large numbers of grasshopper eggs this fall, and it is highly important that it should be handled in such manner as to prevent the emergence of young grasshoppers next spring. Plowing the land to a depth of 4 to 6 inches will do it. Grasshopper eggs are laid in pods which seldom extend more than 2 inches into the ground. The young grasshoppers emerge through the upper end of the pod, which is very near the surface. Experiments made with egg pods buried at various depths show that the young grasshoppers, after hatching, cannot penetrate more than 3 inches of fairly compact earth. Furthermore, observations made during the past three summers in heavily infested areas showed very few newly hatched grasshoppers in crops planted on plowed stubble, whereas in adjoining crops that were planted on unplowed stubble young grasshoppers often swarmed over the entire field as soon as hatching was well under way.

WHEN AND HOW TO PLOW

Plowing may be done with either a moldboard plow (fig. 3) or a disk plow, but the former is the more effective. If the furrow slice is left standing on edge, many young grasshoppers may work to the surface. Harrowing or otherwise compacting the soil after plowing will give better control. Plowing is effective if done any time before the eggs hatch and should be done at a time that is in accord with the best agricultural practice for the locality concerned.

It is realized that in some localities plowing is not recommended because of soil drifting. In such cases shallow cultivation with a disk harrow will bring some of the eggs to the surface, where they are destroyed by drying out. Disking during dry, hot weather is most effective. Repeated diskings will bring additional eggs to the surface, but complete control cannot be secured at a reasonable cost by this operation and should only be resorted to where plowing is impractical.

"STUBBLING-IN" ENCOURAGES GRASSHOPPER OUTBREAKS

Because of rainy weather and economic conditions an unusually large number of farmers seeded their 1933 crops by merely drilling them into the previous year's unworked stubble. This practice is commonly called "stubbling-in" and is generally considered poor farming, but in 1933 a very late, wet spring gave little time for plowing, and many farmers had no money to buy gasoline for their tractors. In many localities it was a question of no crop or a stubbled-in crop. In areas where grasshoppers were abundant, stubbling-in was a costly venture. Grasshoppers hatched throughout the fields; and in many instances, by the time the damage was noticed and poisoned bait could be obtained and scattered, the crop was completely destroyed. Even when stubbled-in crops were saved by the use of poisoned bait, the cost was excessive because the entire field had to be poisoned several times.

To stubble-in the 1934 crops will be even more costly than was this practice in 1933, because of the increased abundance of the migratory grasshopper, which lays most of its eggs in stubble land. Farmers who follow this practice, particularly in fields that swarmed with grasshoppers during July and August, are jeopardizing not only their own crops but those of their neighbors as well. Grasshoppers hatching from unplowed fields will spread from one farm to another and greatly increase the cost of grasshopper control by poisoning, which is the only practical method after hatching has occurred.

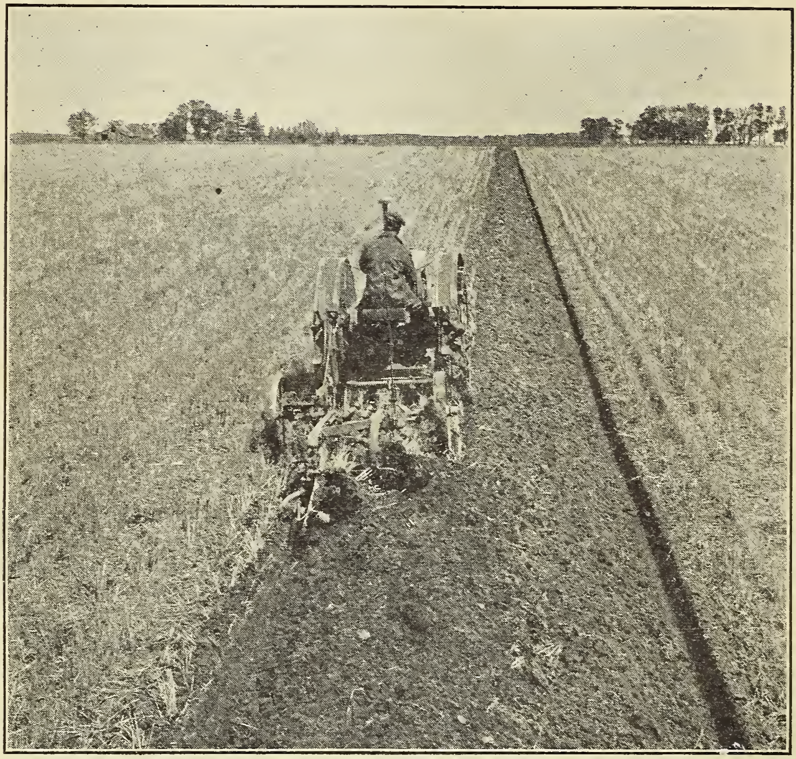

FIGURE 3.—Plowing a stubble field to turn under grasshopper eggs so deeply that the young hoppers upon hatching, cannot reach the surface.

COOPERATIVE MEASURES MOST EFFECTIVE

If farmers in grasshopper-infested districts would unite in an effort to plow all stubble land before May 15, they could destroy the great bulk of grasshoppers in a regular farming operation that would cost no additional money. Grasshoppers hatching outside of stubble fields could then be effectively poisoned at comparatively little expense.

U. S. GOVERNMENT PRINTING OFFICE: 1933

For sale by the Superintendent of Documents, Washington, D. C. - - - - - - - - - - Price 5 cents